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ABSTRACT

This pamphlet offers suggestions for improving laboratory safety. It is based on the notion that having an understanding of inherent hazards and learning how to be safe should be an integral and important part of science education. It is organized into "steps requiring minimal expense" and "steps requiring moderate expense." Included in these guidelines are suggestions for procedural, equipment, and personnel practices. A list of nine references is given, with an address and price for each. (CW)

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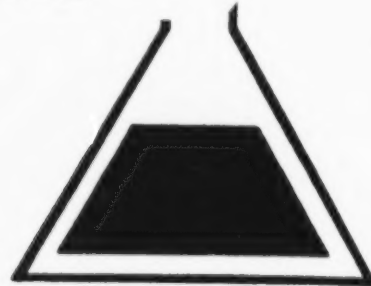
LABORATORY SAFETY GUIDELINES

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**40 SUGGESTIONS
FOR IMPROVING
LABORATORY SAFETY**

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**—JAMES A. KAUFMAN—
LABORATORY SAFETY CONSULTANT**

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LABORATORY SAFETY GUIDELINES

40 STEPS FOR A SAFER LABORATORY

by James A. Kaufman, PhD†

We offer these suggestions for improving laboratory safety because we believe that having an understanding of inherent hazards and learning how to be safe should be an integral and important part of science education.

Steps Requiring Minimal Expense

1. Organize a departmental safety and health committee of faculty members, support staff, and students.
2. Have the departmental safety and health committee meet regularly to discuss safety problems and seek solutions to them.
3. Develop a safety and health orientation program for all students and new staff members.
4. Encourage students and staff members to develop a concern for their own safety and that of others.
5. Involve every staff member in some aspect of the safety program and give each specific responsibilities.
6. Provide incentives to students and staff for safety performance.
7. Require all staff members to read the appropriate safety manual. Require students to read the school's laboratory safety rules. Have both groups sign a statement that they have done so and understand the contents. Keep these statements on file in the departmental office.
8. Conduct periodic, unannounced laboratory inspections to identify and correct hazardous conditions and unsafe practices. Involve students in a simulated OSHA inspection.
9. Schedule regular departmental safety meetings for students and staff to discuss the results of inspections and aspects of laboratory safety.
10. Make learning how to be safe an integral and important part of the science education process.
11. Require every pre-lab discussion to include consideration of safety and health aspects.
12. Forbid working alone in any laboratory and working without prior knowledge of a staff member.
13. Don't allow experiments to run unattended unless they are failsafe.
14. When conducting experiments with hazards or potential hazards - Ask yourself these questions:
 - "What are the hazards?"

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- "What are the worst possible things that could go wrong?"
 - "How will I deal with them?"
 - "What are the prudent practices, protective facilities and equipment necessary to minimize the risk of exposure to the hazards?"
- Consider reducing the scale of the experiment, substituting less hazardous chemicals, or eliminating the experiment.

15. Require all accidents (incidents) to be reported, evaluated by the departmental safety committee, and discussed at departmental safety meetings.
16. Extend the safety program beyond the laboratory to the automobile, and the home.
17. Allow only minimum amounts of flammable liquids in each laboratory.
18. Forbid smoking, eating, and drinking in the laboratory.
19. Do not allow food to be stored in chemical refrigerators.
20. Develop plans and conduct drills for dealing with emergencies such as fire, explosion, poisoning, chemical spill or vapor release, and personal contamination.
21. Display the phone numbers of the fire department, police department, and local ambulance immediately next to every departmental phone.
22. Store acids and bases separately. Store fuels and oxidizers separately.
23. Maintain a chemical inventory to avoid purchasing unnecessary quantities of chemicals.
24. Use warning signs to designate particular hazards.
25. Require good housekeeping practices in all working areas.
26. Develop specific work practices for individual experiments, such as those that should be conducted only in a ventilated hood or involve especially hazardous chemicals.

Steps Requiring Moderate Expense

27. Allocate a portion of the departmental budget to safety.
28. Require the use of goggles in all laboratories.
29. Provide adequate supplies of personal protective equipment - goggles, face shields, gloves, lab coats, and bench top shields. When possible most hazardous experiments should be done in a hood.
30. Provide fire extinguishers, safety showers, and eye-wash facilities and ventilated hoods in each laboratory and test or check monthly.
31. Maintain a centrally located departmental safety library:
 - "Safety in Academic Chemistry Laboratories" (1 copy free)

American Chemical Society
1155 16th Street N.W.
Washington, DC 20036

- "Fire Protection Guide on Hazardous Materials" (\$10)
National Fire Protection Association
Batterymarch Park
Quincy, MA 02269
- "Manual of Safety and Health Hazards in the School Science Laboratory" (\$5.75)
"Safety in the School Science Laboratory" (FREE)
Council of State Science Supervisors
Route 2, Box 637
Lancaster, VA 22503
- "Better Science Through Safety" by Gerlovich and Downs, (\$16.00)
Iowa State University Press
Ames, Iowa 50010
- "Handbook of Laboratory Safety" Edited by N. Steere (\$60)
CRC Press
2000 Corporate Blvd., N.W.
Boca Raton, FL 33431
- "Prudent Practices For Handling Chemicals In Laboratories" (\$15)
"Prudent Practices For Disposal of Chemicals From Laboratories" (\$15)
National Academy Press
2101 Constitution Ave., N.W.
Washington, DC 20418
- "Safety in the Secondary Science Classroom" (\$5.00)
National Science Teachers Assn.
1742 Connecticut Avenue, N.W.
Washington, DC 20005

32. Provide guards on all vacuum pumps and secure all compressed gas cylinders.
33. Provide an appropriate supply of first aid equipment and instruction on its proper use.
34. Remove all electrical connections from inside chemical refrigerators and require magnetic closures.
35. Require grounded plugs on all electrical equipment.
36. Label all chemicals to show nature and degree of hazard.
37. Develop a program for dating stored chemicals and for discarding them after predetermined maximum periods of storage.
38. Develop a system for the safe and ecologically acceptable disposal of chemical wastes.
39. Provide fireproof cabinets for storage of flammable chemicals.
40. Provide well ventilated storage for odiferous chemicals.

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